"Decision-making in agricultural production in the Argentine Pampas: Alternative choice process formulations and the value of climate information"

Start Date: June 1, 2004
Project Duration: 3 years

PIs:
Elke U. Weber, Columbia University, Center for the Decision Sciences
David Letson, University of Miami, Rosenstiel School of Marine & Atmospheric Science
Guillermo Podesta, University of Miami, Rosenstiel School of Marine & Atmospheric Science

Extended Abstract

The emerging ability to forecast regional climate based on ENSO signals offers agricultural decision-makers the opportunity to mitigate unwanted impacts and take advantage of expected favorable conditions. However, efforts to foster effective use of climate information in agriculture must be grounded in a firm understanding of the goals, objectives and constraints of decision-makers in this system for three reasons:

- First, estimates of the economic value of climate information and forecasts—which help justify public investment in this technology—should be based on models closely linked to observed decision processes, rather than on the almost exclusively used normative models of choice which have been shown to be poor descriptors and predictors of human decision making. The economic value of climate information may be larger or smaller as the result of using a more accurate decision problem and process formulation.
- Second, the goals and objectives of farmers' decisions (i.e., their objective functions, in decision theoretical terms) influence how climate information is used and, in turn, how climate information should be presented and communicated. The current content and format of climate forecasts reflect implicit assumptions about what farmers are trying to achieve and how such information will be used. Information content and format can be improved by making these assumptions explicit and putting them to test.
- Finally, decision makers in numerous domains have been shown to have poor insight into their own decision processes, goals and objectives. Studying those processes, goals, and objectives offers farmers and other real-world decision makers the opportunity to reflect on the desirability of making their decisions in the way they are currently made. Affirmation of goals, objectives, and processes will allow for a revision of prescriptive models of choice to include the full range of objectives and processes endorsed by decision makers after conscious reflection. Concern about goals, objectives, or processes will allow for the design

of decision aids, expert consultation and advice, and other interventions designed to modify decision processes rejected by decision makers after conscious reflection.

More specifically, the project goal is to understand and model decision-making in agricultural production systems in the Argentine Pampas in the face of climate variability and other risk factors, and in response to improved climate information and climate forecasts. We will place a strong emphasis on understanding the dynamics of human behavior and decisions, particularly with respect to choice and uncertainty in the context of agricultural production, an important, prevalent, and dynamic climate-sensitive system. Our approach will be based on a combination of modeling and field work. Simulation of decision outcomes (crop yields and economic returns) with and without the benefit of climate forecasts of various types and skill levels will enable estimation of forecast value under different farmer objective functions. Field decision experiments will identify what farmers are trying to achieve using a large sample of Pampas farmers and assess the prevalence of decision processes and decision objectives that fall outside of the subjective expected utility model conventionally used in economics and value-of-information analyses. Possible objectives include the prescriptive goal of maximizing farm profitability, but also a selective focus on subgoals such as the maximization of crop yields, the maximization of crop prices, and the minimization of input costs, which only result in the overall maximization of farm profitability if equally attended to. In addition, farmers may have nonmaterial goals, such as the minimization of mental effort in making production or pricing decisions, or the avoidance of conflict or post-decisional regret.

Another innovation of our project research is the consideration of heterogeneity in the population of decision makers. Our pilot data suggest that there are differences in the implicit and explicit goals and objectives that guide production decisions of farmers as compared to those advocated by technical advisors. We also have found individual differences in decision objectives and resulting choices among farmers, some of which are predictable from personality traits. A more systematic understanding of predictable heterogeneity in objectives and goals in the population of decision makers—which our project research will provide—will form a basis for providing decision support in the form of information provision and decision aids that is customized for specific sub-types of decision makers.